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Abundance and Seasonality of Infauna and Epifauna Inhabiting a *Halodule wrightii* Meadow in Apalachicola Bay, Florida

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ABSTRACT: The fauna inhabiting a *Halodule wrightii* meadow in Apalachicola Bay, Florida, was studied from March 1975 through February 1976. The infaunal community was sampled by monthly coring. Fifty-eight species were recorded, averaging 35 species per month. A maximum faunal abundance of 104,338 organisms per m² in April was one of the highest infaunal densities recorded in the literature. Sixteen species accounted for 84% of the total numbers and 80% of the total biomass over the study period. Numerical dominants were *Hargeria rapax, Heteromastus filiformis, Ampelisca vadorum, Aricidea fragilis,* and oligochaetes. Biomass dominants were *Tagelus plebeius, Neritina reclivata, Ensis minor,* and *Haploscoloplos fragilis.* Life history notes are given for several dominant species. Epibenthic fishes and macroinvertebrates were sampled by monthly trawling. Twenty-three species of fishes (mostly juveniles) were collected near the coring site, with most species and individuals recorded during the months May through September. *Bairdiella chrysoura, Orthopristis chrysoptera,* and *Lagodon rhomboides* comprised 76% of the total fish numbers. Eleven species of macroinvertebrates were collected mainly in June and July. *Callinectes sapidus* comprised 61% of the total invertebrate numbers. It is postulated that the influx of juvenile fishes and crabs into the *Halodule* meadow in summer months leads to a coincident decline in infaunal population densities (number per m²) through predation. Infaunal biomasses are largely unaffected by these predators since the biomass dominants are large or deep-burrowing species.

Introduction

The benthic faunas of seagrass meadows have been studied for many years. Although *Halodule wrightii* (shoal grass) has the widest range in both geographic distribution and environmental tolerance of any seagrass in the Gulf of Mexico (Humm 1973), studies on the faunas of *Halodule* meadows remain quite limited. O'Gowar and Wacasey (1967) and Moore et al. (1968) conducted summer studies of the larger organisms in *Halodule* meadows in Biscayne Bay, Florida. Santos and Simon (1974) analyzed the polychaete fauna of a *Halodule* bed in Tampa Bay, Florida, on a quarterly basis, and Young and Young (1977) performed infaunal studies in the Indian River estuary of Florida for a six-month period (September–February). The comparison of the results of these four studies (e.g., by numbers or biomass per m²) is confounded by the use of four different sieve mesh sizes (3.0, 1.6, 0.5, and 1.0-mm meshes, respectively) and the limited sampling periods.

The present investigation was part of a multi-disciplinary study of the Apalachicola estuary of northwest Florida. The results of a variety of studies are summarized by Livingston et al. (1977). The present investigation concerns of 12-month survey of the infauna and epibenthic fishes and invertebrates of a *Halodule wrightii* meadow.

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This seagrass is found on the bay side of the barrier islands surrounding Apalachicola Bay, although the meadows are not extensive (less than 5% of the bottom area) in this turbid estuary (Livingston 1980).

Materials and Methods

The sampling site was located approximately 2 km east of Bob Sykes Cut (through St. George Island) in Apalachicola Bay, Franklin County, Florida (Livingston et al. 1977, Station 1X). The site was shallow (maximum observed: 1.5 m at high tide) and situated in a meadow of *Halodule wrightii* between a brackish water marsh (*Juncus roemerianus*) and an oyster bar. Monthly sampling was conducted during daylight hours from March 1975 through February 1976. Bottom water samples were taken with a 1-liter Kemmerer bottle prior to biological sampling. Temperature was measured with a stick thermometer or a YSI dissolved oxygen meter. Salinity was measured with a temperature-compensated refractometer. Color was measured with a (Hach) American Public Health Association Pt-Co standard test, and turbidity was measured with a Hach 2100A turbidimeter. Light penetrance was measured with a Secchi disk.

On each date, ten cores (total area, 456 cm^2; depth, 15 cm) were taken with a hand-operated corer, rinsed through a 0.5-mm mesh sieve, and the remainder preserved in 10% formalin containing rose bengal. Organisms were identified, counted, dried at 100 °C to a constant weight (dry weight), burned in a muffle furnace at 500 °C for 4 hours, and reweighed (ash-free dry weight). Data were subsequently converted to a per m^2 basis for comparative purposes.

A sediment sample of approximately 500 g was also collected each month. A subsample was dried and burned as above to determine organic content. The remaining sediment was washed through a series of sieves (Ingram 1971), and each fraction was dried at 100 °C and weighed. The mean particle size (ϕ) was graphically determined from formulae given by Folk (1974).

Collections of epibenthic fishes and macroinvertebrates were made with a 5-m otter trawl (20-mm mesh wing and body; 6-mm mesh liner). Replicate 2-min tows were taken at speeds of 2 to 3 knots. All organisms collected were preserved in 10% formalin, sorted and identified to species, and counted or measured (standard length for fishes; total length for shrimps; carapace width for crabs).

Results and Discussion

A summary of physical, chemical, and biological characteristics of the study site is presented in Table 1. The water was usually clear and well-oxygenated. Temperature fluctuated from 11.5 °C in January to 30.5 °C in August, while salinity varied between 6.3 and 26.8‰. Sediment grain size did not vary substantially during the sampling period, but the organic content showed some seasonality (Table 1).

Fifty-eight species of benthic invertebrates were recorded during the coring survey, 12 of which were recorded on only 1 or 2 dates. An average of 35 species was collected each month, with more species recorded in winter than in summer months (Table 1). Infaunal abundance was highest in spring (April: 104,338 organisms per m^2) and lowest in summer (August: 7,409 organisms per m^2), while total biomass fluctuated irregularly. The 16 most abundant species accounted for 84% of the total number of individuals and 80% of the total biomass recorded. The seasonal distributions of infaunal numbers and biomasses are tabulated in Appendix 1.

DOMINANT INFAUNAL SPECIES (TABLE 2)

Hargeria rapax. This tanaid had an average monthly density of 6,342 per m^2 (range: 394 to 18,303 per m^2) and constituted 16.4% of the total fauna. It was the most abundant organism in four collections (May, 31% of the fauna; June, 30.8%; January, 16.6%; February, 24.4%) although it contributed little to total biomass, either overall (2.3%) or during months of peak abundance (1.5 to 6.8%; 0.018 to 0.745 g per m^2). *Hargeria* reached peak abundance (18,303 per m^2) and biomass (0.745 g per m^2) in February. Gravid females were noted in all months except September and were particularly abundant in February and March. Odum and Heald (1972) found *Hargeria* sp. to be detritivorous.

Heteromastus filiformis. This polychaete had an average density of 5,694 per m² (range: 636 to 17,536 per m²) and represented 14.7% of the total infauna. It was the most abundant organism on three occasions (March, 23.6% of the fauna; April, 16.8%; July, 25.0%) and was second in abundance in May, June and August. *Heteromastus* contributed 4.7% of the total biomass and up to 11.6% of the monthly biomass during maximum abundance. Watling (1975) and Myers (1977) list this species as a deposit feeder.

Ampelisca vadorum. This tube-building amphipod had an average density of 3,867 per m² (range: 197 to 11,574 per m²) and constituted 10% of the total infauna. It was numerically dominant in October and December (20.1 and 12.9% of the faunas, respectively) and was second in abundance in September and February. Total biomass contribution was 3.4% and ranged up to 8.5% (1.092 g per m²) of the February biomass. Gravid females were found all year, particularly in February. Mills (1967) found *Ampelisca* to be a deposit-feeder.

Oligochaetes. Unidentified oligochaetes had a mean density of 3,746 per m² (range: 1,556 to 7,676 per m²) and represented 9.6% of the total infauna. This group was dominant in August (25% of the organisms) and was second in abundance in July and January, although oligochaetes contributed less than 2% of either monthly or total biomass.

Aricidea fragilis. This polychaete had a mean density of 3,026 per m² (range: 132 to 12,955 per m²) and represented 7.8% of the total infauna. It was never a monthly dominant but in March and April when it was most numerous (10,149 and 12,955 per m²), *Aricidea* constituted 20.5 and 12.4% of the respective infaunas. Its biomass was 1.6% of the total but ranged up to 8.2% of the March biomass. Santos and Simon (1974) list this species as a deposit-feeder.

Tagelus plebeius. Although contributing little to the numerical total (0.3%) and being relatively rare in monthly abundance (mean, 128 per m²; maximum, 723 per m²), this bivalve was by far the major biomass component of the *Halodule* infauna (33% of the total biomass). *Tagelus* had a mean biomass of 3.108 g per m², ranged up to 9.704 g per m² in August, and was the biomass dominant from May through January. Peak

TABLE 1. Physical, chemical, and biological characteristics of a *Halodule wrightii* meadow in Apalachicola Bay, Florida, from March 1975 through February 1976. ND = no data. Fish and invertebrate data are given as number per 2 trawl-tows. Infaunal biomass is given as ash-free grams per m².

	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Depth (m)	0.7	0.7	0.7	1.2	1.2	1.3	1.0	1.0	0.9	1.4	1.0	0.9
Secchi depth (m)	0.6	0.6	0.7	1.1	1.1	1.2	0.9	1.0	0.9	1.4	1.0	0.9
Temp. (°C)	16.8	20.0	27.5	26.0	28.3	30.5	23.3	25.1	18.0	18.0	11.5	20.0
Salinity (‰)	16.0	6.3	19.3	26.8	18.2	19.3	14.2	14.2	19.0	23.2	10.5	20.0
Color (Pt-Co)	50	50	25	20	35	10	ND	20	5	0	0	0
Turbidity (JTU)	4	13	2	2	7	1	ND	2	2	1	3	2
Oxygen (mg/l)	8.5	14.4	ND	9.3	6.8	11.1	13.8	13.4	11.8	ND	13.0	12.3
Median grain size (ϕ)	2.00	1.85	1.95	2.00	2.00	1.95	2.05	2.15	2.10	2.10	2.05	2.05
Sedimentary organics (%)	1.78	1.76	1.68	1.64	2.00	2.42	2.16	2.26	2.47	2.56	2.36	1.68
Infaunal species (#)	40	35	29	37	23	27	36	37	39	43	42	39
Infaunal density (per m²)	49,562	104,338	39,850	39,677	17,034	7,409	15,411	19,862	22,557	19,930	54,780	74,947
Infaunal biomass (g)	7.41	12.17	5.90	12.26	5.65	11.22	10.05	9.45	5.99	7.94	12.28	12.81
Fish species	2	7	7	9	15	9	10	8	5	4	0	4
Fish density	13	21	296	104	595	194	144	80	26	4	0	46
Invertebrate species	3	1	1	2	4	2	4	4	1	1	1	3
Invertebrate density	4	1	2	31	39	10	4	5	2	1	1	7

TABLE 2. Number (N) and biomass (B) per m^2 of dominant infaunal species inhabiting a *Halodule wrightii* meadow in Apalachicola Bay, Florida, from March 1975 through February 1976. B = mg ash-free dry weight.

Species		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mean
Hargeria rapax	N	1,337	14,138	12,363	12,209	1,666	789	394	1,951	1,490	2,389	9,075	18,303	6,342
	B	48	640	401	187	18	22	20	45	45	69	390	745	219
Heteromastus filiformis	N	11,705	17,536	9,075	7,409	4,252	1,359	1,140	789	636	1,252	4,888	8,286	5,694
	B	581	870	681	815	595	202	205	158	102	163	508	441	443
Ampelisca vadorum	N	2,565	5,853	1,666	6,357	2,543	197	1,973	3,989	2,324	2,565	4,800	11,574	3,867
	B	234	489	162	257	112	15	154	263	139	231	662	1,092	318
Oligochaetes	N	4,055	6,335	4,603	4,099	4,099	1,885	1,556	2,017	2,302	1,600	7,672	4,735	3,746
	B	136	190	138	123	111	43	36	48	53	38	208	125	104
Aricidea fragilis	N	10,149	12,955	1,688	482	680	723	132	263	1,578	1,512	3,836	2,324	3,026
	B	604	648	68	14	17	15	3	8	47	60	186	145	151
Tagelus plebeius	N	197	723	153	132	22	88	22	66	22	44	22	44	128
	B	20	353	1,320	6,337	1,537	9,704	2,676	5,026	2,218	4,533	3,562	13	3,108
Neritina reclivata	N	22				88	66	614	285	219	263	197	548	192
	B	46				1,168	37	64	706	879	721	502	4,090	684
Haploscoloplos fragilis	N	1,973	3,376	263	658	395	153	197	66	482	526	2,652	3,222	1,163
	B	835	1,857	184	559	391	162	296	132	289	47	219	421	449

abundance was found in January. Holland and Dean (1977) found this bivalve to be a suspension-feeder.

Neritina reclivata. This gastropod was not numerically abundant (mean, 192 per m^2; maximum, 614 per m^2 in September), but it was the second most important species in terms of overall biomass (7.2% of the total). Its major contribution came in February when *Neritina* was the biomass dominant (31.5% of the biomass, 4.090 g per m^2).

Haploscoloplos fragilis. This polychaete was one of the more numerous species (range: 66 to 3,376 per m^2), representing 3% of the total numerical infauna and having a mean density of 1,163 per m^2. It represented 3.1% of the total biomass and dominated in March (11.3% of the biomass; 0.835 g per m^2) and April (15.3%; 1.857 g per m^2).

Other numerically important species (Appendix 1) included the amphipods *Mucrogammarus mucronatus* (February–April) and *Cymadusa compta* (October–January), and the polychaetes *Streblospio benedicti* (March–May), *Fabricia* sp. (January–February), and *Hobsonia florida* (January–May). Several species were at times important biomass contributors, including unidentified rhynchocoels (April), the isopod *Cyathura polita* (September, October, and February), the bivalve *Ensis minor* (January, 23% of the biomass), and the polychaete *Parandalia americana* (September, February).

Seagrass Meadow Infauna—Densities and Dominants

A rich infaunal community was supported by this *Halodule* meadow. Previous investigators have had similar findings, particularly in comparison with nonvegetated areas, but the study site in Apalachicola Bay was one of the most densely populated areas reported in the literature (Table 3). This seagrass meadow supported an infauna with a 12-month mean density of 38,780 per m^2 and 17,815 polychaetes per m^2. The only other study which was conducted over 12 months and employed a similar sieve was that of McBee and Brehm (1979), who found a mean infaunal density of 10,366 per m^2 in a *Ruppia maritima* bed. Santos and Simon (1974) reported mean densities of 33,485 polychaetes per m^2 in *Thalassia testudinum* beds and 13,313 polychaetes per m^2 in adjacent *Halodule* beds, but their figures were based on quarterly sampling only. Further comparisons are affected by the sieve mesh size employed and the duration and frequency of sampling (Table 3). In comparing the faunas collected by 1.0 and 0.5-mm mesh sieves, Mahadevan (1979) noted 2 to 6 times as many individuals in the smaller sieve as in the larger. McCall (1977) found that a 0.297-mm mesh sieve could collect up to 50 times more individuals of certain species than could a 1.0-mm mesh sieve. This is the most likely reason for the high mean density of 62,289 individuals per m^2 (25-month study) reported in Rehoboth Bay by Watling (1975) using a 0.25-mm mesh sieve and the low mean density of 1,113 per m^2 reported for Biscayne Bay by O'Gowar and Wacasey (1967) using a 3.0-mm mesh sieve for one month only (Table 3). The present study also found a high monthly density of 104,338 organisms per m^2 (Table 1) and 58,183 polychaetes per m^2. In comparison, Santos and Simon (1974) reported a maximum of 63,830 polychaetes per m^2 and Watling (1975) found a peak of 270,360 organisms per m^2 (0.25-mm mesh sieve).

Comparison of the dominant organisms in several of these infaunal studies (bearing in mind previous comments) demonstrates wide variation in community composition (Table 4). The major organisms found by Bloom et al. (1972) and Mahadevan (1979) bear little resemblance to any of the other studies and have only one organism (*Diastoma*) in common, even though both studies were conducted in the Tampa Bay, Florida area. These two studies also found fewer polychaetes and more major taxonomic groups among the dominants than did other investigations. Young and Young (1977) found that seven major taxa comprised the 10 most abundant species, but several polychaetes were common to other studies (*Polydora, Streblospio, Exogone*). The dominant species in the present study were most similar to those of Watling (1975) and Orth (1973), having four in common with each (*Streblospio, Heteromastus, Ampelisca,* oligochaetes). The most abundant group in each of these three studies was the polychaetes. Of the nine most abundant polychaetes in

TABLE 3. Comparison of mean organism densities and sieve sizes from selected benthic infaunal studies. Asterisk (*) indicates samples taken at least monthly for at least 12 months (others are seasonal). p = polychaetes only.

Location	Mean Density (per m²)	Seagrass present	Sieve (mm)	Reference
Apalachicola Bay, Fla.	38,780*	*Halodule wrightii*	0.5	This study
	17,815*p	*Halodule wrightii*	0.5	This study
Tampa Bay, Fla.	33,485 p	*Thalassia testudinum*	0.5	Santos and Simon (1974)
	13,313 p	*Halodule wrightii*	0.5	Santos and Simon (1974)
Simmons Bayou, Miss.	10,366*	*Ruppia maritima*	0.52	McBee and Brehm (1979)
Chesapeake Bay, Va.	15,713	*Zostera marina*	1.0	Orth (1973)
Indian River, Fla.	8,291	*Halodule wrightii*	1.0	Young and Young (1977)
Moriches Bay, N.Y.	5,402	*Zostera marina*	1.0	O'Connor (1972)
Anclote Anchorage, Fla.	3,285*	mixed assemblage	1.0	Mahadevan (1979)
Biscayne Bay, Fla.	5,000	*Halodule wrightii*	1.6	Moore et al. (1968)
Biscayne Bay, Fla.	1,113	*Halodule wrightii*	3.0	O'Gowar and Wacasey (1967)
Rehoboth Bay, Del.	62,289*	none	0.25	Watling (1975)
Long Island Sound, N.Y.	9,486	none	0.297	McCall (1977)
Delaware Bay, N.J.–Del.	722	none	1.0	Maurer et al. (1978)
Tampa Bay, Fla.	510	none	1.0	Bloom et al. (1972)

the results of our study and that of Santos and Simon (1974), three were held in common (*Heteromastus, Streblospio, Fabricia*).

Epibenthic Fishes and Macroinvertebrates

Twenty-three species and 1,523 individual fishes were collected during the study. The predominant fishes were juveniles of *Bairdiella chrysoura* (40% of the total fishes; range of mean monthly sizes: 17–72 mm SL), *Orthopristis chrysoptera* (20%; 15–99 mm), *Lagodon rhomboides* (16%; 25–122 mm), and *Cynoscion nebulosus* (8%; 24–75 mm). These four species were most abundant from May through September when they formed 82 to 97% of the fish fauna. Fishes were generally not abundant for the remainder of the year (e.g., none were caught in January). However, *Leiostomus xanthurus* (15–36 mm) utilized the *Halodule* meadow from February through April.

Eleven species and 107 individual macroinvertebrates were collected. *Callinectes sapidus* was the dominant species, comprising 61% of the total numbers. *Callinectes* was found in small numbers in January and February (15–36 mm CW) and in larger numbers from June through August (55–66 mm). *Penaeus duorarum* (11% of the total invertebrates) and *Palaemonetes vulgaris* (9%) were the next most abundant invertebrates and were found mainly in July.

The influx of juvenile fishes and macroinvertebrates into the *Halodule* meadow beginning in May and lasting into September coincided with the rapid decline in the infaunal densities (Table 1). Although direct evidence is lacking in this study, the data suggest predation by the epibenthic fishes and macroinvertebrates as a major cause for the reduced infaunal densities. Quantitative studies on the trophic relations of the dominant fishes and invertebrates give supporting evidence. Carr and Adams (1973) and Stoner (1979, 1980) examined the feeding habits of fishes in seagrass meadows of the Florida coast and found that juveniles of *Bairdiella, Orthopristis* and *Lagodon* were major predators of polychaetes and amphipods. Sheridan (1979) documented the benthic feeding habits of juvenile *Leiostomus* throughout Apalachicola Bay, finding heavy predation on polychaetes and bivalves. Virnstein (1977) compared densities of benthic communities subjected to predation by caged *Leiostomus* and *Callinectes* with densities in predator-free communities and found significant reductions in infaunal densities. Virnstein noted that the infaunal species most affected were smaller forms and those living close to the sediment surface, whereas the species least affected lived deeper, retracted quickly, or were large-bodied. While the decrease in population densities in the present study was perhaps related to increased predation, biomass remained relatively stable. This was due to

TABLE 4. Comparison of benthic community dominants (ranked in decreasing order of abundance) in various study areas. See Table 3 for additional information. (A = amphipod, B = bivalve, C = cephalochordate, E = echinoderm, G = gastropod, I = isopod, P = polychaete, S = sipunculid, T = tanaid.)

Watling (1975)	Orth (1973)	Young and Young (1977)	Mahadevan (1979)
Capitella capitata (P)	*Heteromastus filiformis* (P)	*Clymenella mucosa* (P)	*Diastoma varium* (G)
Streblospio benedicti (P)	*Spiochaetopterus oculatus* (P)	*Polydora ligni* (P)	*Cymadusa compta* (A)
Oligochaetes	*Streblospio benedicti* (P)	*Phascolion* sp. (S)	*Caecum nitidum* (G)
Polydora ligni (P)	*Nereis succinea* (P)	*Exogone dispar* (P)	*Aricidea fragilis* (P)
Ampelisca abdita (A)	*Polydora ligni* (P)	Paratanaidae (T)	*Mitrella lunata* (G)
Heteromastus filiformis (P)	*Ampelisca vadorum* (A)	*Cymadusa* sp. (A)	*Elasmopus laevis* (A)
Brania clavata (P)	Oligochaetes	*Streblospio benedicti* (P)	Oligochaetes
Exogone dispar (P)	*Ampelisca abdita* (A)	Nemertines	*Axiothella mucosa* (P)
Gemma gemma (B)	*Prionospio heterobranchia* (P)	*Cerithium muscarum* (G)	*Branchiostoma caribaeum* (C)
Parasterope pollex (P)	*Edotea triloba* (I)	*Erichsonella filiformis* (I)	*Branchiomma nigromaculata* (P)
Bloom et al. (1972)	**This Study**	**This Study (polychaetes)**	**Santos and Simon (1974, polychaetes)**
Diastoma varium (G)	*Hargeria rapax* (T)	*Heteromastus filiformis*	*Onuphis eremita*
Tagelus divisus (B)	*Heteromastus filiformis* (P)	*Aricidea fragilis*	*Prionospio heterobranchia*
Onuphis eremita (P)	*Ampelisca vadorum* (A)	*Streblospio benedicti*	*Laeonereis culveri*
Branchiostoma caribaeum (C)	Oligochaetes	*Fabricia* sp.	*Lumbrinereis tenuis*
Nassarius vibex (G)	*Aricidea fragilis* (P)	*Haploscoloplos fragilis*	*Clymenella mucosa*
Acanthohaustorius sp. (A)	*Streblospio benedicti* (P)	*Hobsonia florida*	*Heteromastus filiformis*
Ophiofragmus filograneus (E)	*Mucrogammarus mucronatus* (A)	*Polydora ligni*	*Fabricia sabella*
Macoma constricta (B)	*Fabricia* sp. (P)	*Nereis succinea*	*Capitella capitata*
Arabella iricolor (P)	*Haploscoloplos fragilis* (P)	*Capitella capitata*	*Streblospio benedicti*
Diopatra cuprea (P)	*Hobsonia florida* (P)		

the dominant contributions to the community biomass of comparatively large or deep-burrowing species like *Tagelus, Neritina, Ensis,* and *Haploscoloplos* which were to some extent protected from predation by juvenile fishes and macroinvertebrates.

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APPENDIX 1. Monthly mean abundance (N), standard deviation of replicates (SD), and biomass of pooled replicates (B, mg ash-free dry weight) per m² of benthic organisms inhabiting a *Halodule wrightii* meadow in Apalachicola Bay, Florida, from March 1975 through February 1976. Asterisk (*) indicates biomass of less than 1 mg per m².

Species		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Amphipoda													
Ampelisca vadorum	N	2,565	5,833	1,666	6,357	2,543	197	1,973	3,989	2,324	2,565	4,800	11,574
	SD	2,477	4,735	921	4,559	1,600	241	1,622	2,236	1,995	1,228	1,841	5,918
	B	234	489	162	257	112	15	154	263	139	231	662	1,092
Cerapus sp.	N		44		22								
	SD		88		66								
	B		*		*								
Corophium louisianum	N		66	22	153	44		22			44	110	1,096
	SD		110	66	241	88		66			88	175	833
	B		2	1	4	1		*			1	2	26
Cymadusa compta	N	416	482				22	877	2,608	4,340	1,030	1,074	219
	SD	438	526				66	745	1,491	2,959	548	723	263
	B	37	94				2	74	287	289	154	354	81
Gitanopsis sp.	N	44	22		22								
	SD	88	66		66								
	B	2	*		1								
Grandidierella bonnieroides	N	570	2,214	153	658		66	197	307	789	877	2,192	723
	SD	548	1,184	153	329		153	219	395	789	548	1,030	680
	B	11	230	2	22		2	24	11	64	42	132	86
Melita elongata	N	175	1,184						219		44	22	
	SD	285	3,354						263		88	66	
	B	12	55						2		3	2	
Mucrogammarus mucronatus	N	3,266	11,113	482	395	44	329	2,345	2,784	2,302	943	899	2,345
	SD	1,863	4,713	592	395	88	307	1,707	1,973	1,929	745	482	1,885
	B	550	1,211	20	26	1	8	54	392	200	188	315	504
Polychaeta													
Hobsonia florida	N	964	1,359	1,666	1,293	460	219	1,249	373	680	964	2,499	1,754
	SD	482	986	658	789	241	197	614	285	482	680	1,512	1,315
	B	622	680	666	388	92	28	162	48	88	125	335	278
Arenicola cristata	N	110	44								44	44	
	SD	153	88								88	132	
	B	307	123								3	2	

APPENDIX 1. (Continued.)

Species		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Aricidea fragilis	N	10,149	12,955	1,688	482	680	723	132	263	1,578	1,512	3,836	2,324
	SD	5,851	6,686	2,280	416	504	789	153	219	1,118	877	1,381	1,096
	B	604	648	68	14	17	15	3	8	47	60	186	145
Capitella capitata	N		745	351	44			570	395	416	680	2,937	22
	SD		702	263	88			789	702	351	636	2,828	66
	B		19	10	2			57	40	29	34	64	46
Diopatra cuprea	N	22						66	88	66	66	132	22
	SD	66						197	241	197	110	285	66
	B	276						1,320	89	139	13	2	*
Eteone heteropoda	N	263	460	110	175	110	22		263	66	132	110	307
	SD	219	219	241	219	219	66		373	153	153	241	329
	B	19	33	9	16	11	2		24	7	8	6	40
Fabricia sp.	N	504	1,293	66	1,425	307	66	285	351	263	1,140	4,011	4,537
	SD	438	921	110	899	395	110	241	416	460	1,271	2,630	3,332
	B	4	11	1	28	9	1	11	10	8	23	86	81
Glycinde solitaria	N	132	22	175	110	110	66			88	44	66	110
	SD	153	66	285	110	219	110			110	88	110	110
	B	132	20	140	66	50	24			176	83	127	57
Haploscoloplos fragilis	N	1,973	3,376	263	658	395	153	197	66	482	526	2,652	3,222
	SD	855	1,622	307	351	395	175	285	110	329	285	1,249	1,754
	B	835	1,857	184	559	391	162	296	132	289	47	219	421
Heteromastus filiformis	N	11,705	17,536	9,075	7,409	4,252	1,359	1,140	789	636	1,252	4,888	8,286
	SD	5,436	5,984	3,069	3,069	2,411	1,206	789	855	570	504	1,293	3,156
	B	581	870	681	815	595	202	205	158	102	163	508	441
Parandalia americana	N	88	110	44	88		66	241	197	175	263	44	153
	SD	110	219	88	241		110	263	241	241	241	88	153
	B	206	308	132	301		272	723	394	177	526	116	787
Marphysa sanguinea	N										22		
	SD										66		
	B										23		
Melinna maculata	N	110	416	153	329	351	153	153	241	153	153	263	66
	SD	153	351	175	395	307	285	132	219	153	153	307	110
	B	116	374	122	230	281	147	150	219	173	165	305	175
Nereis succinea	N	416	1,797	219	548	789	329	680	460	592	416	636	964
	SD	373	789	329	329	395	285	570	373	416	307	373	614
	B	462	863	77	164	237	83	190	147	219	179	335	390

APPENDIX 1. (Continued.)

Species		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Paraprionospio pinnata	N								66	44	88	22	
	SD								153	88	241	66	
	B								13	9	15	4	
Phyllodoce fragilis	N								22	44	22		
	SD								66	132	66		
	B								1	2	1		
Polydora ligni	N	3,858	2,148	132	219			132		44	110	921	2,872
	SD	2,302	1,140	110	307			219		153	219	438	1,622
	B	202	150	12	33			26		9	1	18	90
Scoloplos rubra	N	22			22						22	22	
	SD	66			66						66	66	
	B	189			154						41	37	
Sigambra bassi	N	22			66		175	22	153	110	22		88
	SD	66			153		548	66	153	110	66		241
	B	2			7		265	35	230	22	4		13
Streblospio benedicti	N	4,537	15,892	4,976	548	66	153	592	416	1,666	1,118	1,995	2,280
	SD	2,324	5,946	1,885	548	153	285	351	373	1,162	636	899	921
	B	158	477	124	11	1	2	9	7	28	21	39	57
Mollusca													
Acteocina canaliculata	N	22											
	SD	66											
	B	7											
Amygdalum papyria	N	132	175		44			110	66	132	110	307	614
	SD	153	197		88			219	153	153	219	241	460
	B	94	156		26			24	237	13	4	259	890
Crassostrea virginica	N				44								
	SD				88								
	B				918								
Ensis minor	N			22	22							88	
	SD			66	66							110	
	B			802	474							2,839	
Epitonium rupicola	N							197	66		44		22
	SD							329	110		88		66
	B							164	39		7		46
Macoma mitchilli	N	22				66				22	44	44	66
	SD	66				110				66	88	88	110
	B	77				515				138	191	13	2

APPENDIX 1. (Continued.)

Species		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Mangelia sp.	N	22											
	SD	66											
	B	13											
Neritina reclivata	N	22				88	66	614	285	219	263	197	548
	SD	66				241	110	789	307	153	307	416	504
	B	46				1,168	37	64	706	879	721	502	4,090
Nudibranch	N								22				
	SD								66				
	B								4				
Odostomia laevigata	N	88	88	66	22		22	307	66	110	66	219	263
	SD	241	241	110	66		66	351	110	241	153	395	438
	B	12	4	2	4		13	178	4	14	2	5	18
Prunum apicinum	N							22					
	SD							66					
	B							10					
Pseudocyrena floridana	N	460	44	66	44			110		197	175	767	4,406
	SD	504	88	153	88			219		219	219	416	2,674
	B	79	9	24	107			2,367		15	18	41	410
Tagelus plebeius	N	197	723	153	132	22	88	22	66	22	44	22	44
	SD	614	329	241	153	66	110	66	110	66	132	66	88
	B	20	353	1,320	6,337	1,537	9,704	2,676	5,026	2,218	4,533	3,562	13
Isopoda													
Cassidinidea ovalis	N											22	
	SD											66	
	B											2	
Cyathura polita	N	132	329	153	416	241	66	285	307	241	241	460	767
	SD	219	329	197	307	219	110	263	285	153	153	285	351
	B	327	120	57	405	217	48	741	660	213	175	324	789
Edotea montosa	N	44	263	66	110			153	66	22	44	175	285
	SD	88	285	153	175			197	153	66	88	241	395
	B	2	55	2	2			18	2	1	3	10	18
Erichsonella filiformis	N	636	1,775	153	745	153	66	394	416	438	416	811	943
	SD	548	1,469	197	701	197	153	438	438	263	460	438	745
	B	292	4	31	81	2	18	153	133	73	11	219	454
Xenanthura brevitelson	N	153	153	132	44	44	44	88	66	153	153	285	241
	SD	153	197	153	88	88	88	110	110	285	285	241	241
	B	3	2	3	4	4	7	11	2	2	1	1	2

APPENDIX 1. (Continued.)

Species		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Mysidacea													
Bowmaniella dissimilis	N						22						
	SD						66						
	B						5						
Mysidopsis bahia	N							88					
	SD							110					
	B							20					
Mysidopsis bigelowi	N								66				
	SD								110				
	B								9				
Taphromysis bowmani	N	22	110		22		88	66	132	22	44		44
	SD	66	219		66		110	110	241	66	88		88
	B	2	20		3		21	24	26	4	2		*
Other Phyla													
Anemones	N	66	22									88	110
	SD	153	66									175	175
	B	7	*									43	*
Cumaceans	N	22						22	66	44	66	22	
	SD	66						66	153	88	110	66	
	B	*						*	1	1	2	1	
Insect larvae	N			197	44				22			22	88
	SD			263	88				66			66	110
	B			4	1				1			*	2
Hargeria rapax	N	1,337	14,138	12,363	12,209	1,666	789	394	1,951	1,490	2,389	9,075	18,303
	SD	833	7,584	4,998	7,738	1,293	1,008	438	1,403	1,337	1,096	2,981	7,694
	B	48	640	401	187	18	22	20	45	45	69	390	745
Oligochaetes	N	4,055	6,335	4,603	4,099	4,099	1,885	1,556	2,017	2,302	1,600	7,672	4,735
	SD	1,469	2,082	3,902	1,776	2,170	1,293	745	1,271	2,039	855	4,077	2,608
	B	136	190	138	123	111	43	36	48	53	38	208	125
Rhynchocoels	N	219	1,052	636	614	460	175	66	132	66	88	307	285
	SD	153	680	329	263	351	197	110	153	110	110	482	175
	B	682	2,104	700	491	276	70	26	53	1	2	7	379
Turbellarians	N					44					44	22	153
	SD					88					88	66	241
	B					3					2	2	11